

Microbiological Water Quality in Relation to Water-Contact Recreation, Cuyahoga River, Cuyahoga Valley National Park, Ohio

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Introduction and problem

A 23-mile segment of the Cuyahoga River that flows through the Cuyahoga Valley National Park (CVNP) receives discharges of stormwater, combined-sewer overflows, and incompletely disinfected wastewater from urban areas. These discharges result in health risks to the public who use the river for water-contact recreation. Public health concerns arise because concentrations of *Escherichia coli* (*E. coli*) at times greatly exceed recommended maximum levels for water-contact recreation. When found in water, *E. coli* is a useful indicator of contamination from human and (or) animal waste and the possible presence of disease-causing organisms. *E. coli* has been shown to be a reliable predictor of gastrointestinal illness in swimmers exposed to contaminated water (U.S. Environmental Protection Agency, 1986).

The U.S. Geological Survey (USGS) produced numerical models of the Cuyahoga River that indicated a reduction in *E. coli* concentrations in excess of 90 percent reduction is needed in the Cuyahoga River upstream from the CVNP to meet Ohio Environmental Protection Agency standards for water-contact recreation during runoff periods (Myers and others, 1998). Improvements in the treatment and disinfection of sewage overflows of the magnitude needed to restore recreational waters to beneficial uses may take many years. Until then, resource managers need an interim approach to protect human health and to provide safe water-based recreational opportunities for park visitors.

Resource managers at the CVNP would like to promote the use of the river when it is of acceptable quality. Alone, the standard 24-hour *E. coli* test is a poor predictor of future water quality. The elapsed time between the occurrence of elevated fecal-indicator bacteria concentrations in recreational waters and their detection is too long to assess water quality and take adequate control measures in a timely manner.

Goals and objectives

The overall goal of this study is to provide information and decision-support tools to resource managers at the CVNP to help them enhance recreational opportunities and at the same time protect health of visitors who use the river for recreation. Specific objectives to accomplish the overall goal are to

- (1) characterize the occurrence, distribution, and public health significance of microbiological pathogens that may contaminate the river,
- (2) examine the relations between streamflow and concentrations of various microorganisms and between indicator organisms and pathogenic organisms, and
- (3) provide general information on the use of indicator organisms as predictors of the presence of pathogenic organisms and human health risk.

Approach

Water samples were collected during two field studies. The first field study was done during the 2000 recreational season, and samples were analyzed for concentrations and (or) the presence/absence of *E. coli*, *Salmonella*, F-specific coliphage, enteric viruses, infectious enteroviruses, and water chemistry. The second field study was done during the 2002 recreational season, and samples were analyzed for concentrations and (or) the presence/absence of *E. coli*, *Salmonella*, F-specific and somatic coliphage, enteric viruses, infectious enteroviruses, *Clostridium perfringens*, *Cryptosporidium*, *Giardia*, and water chemistry. Field measurements (streamflow, pH, temperature, etc.) were also made at each site when samples were collected. The relations of the microorganisms to each other and to selected water-quality measures were examined.